CLAIMS

What I claim as my invention is:

Claim 1 (currently amended): ~~A multi-roller ball assembly (20), for any ball type constant velocity joint with an outer race (1) having inwardly facing grooves (1a), an inner race (2) having outwardly facing grooves (2a), a cage (4) having windows (4a), comprising:~~ A constant velocity joint comprising:

an outer joint member having an inner surface formed with a plurality of circumferentially distributed ball grooves;

an inner joint member having an outer surface formed with a plurality of circumferentially distributed ball grooves;

a plurality of torque-transmitting ball assemblies disposed between the grooves of the outer and inner joint members, each of said ball assembly comprising:

an annular slide shaft having a first and second lugs at the ends of said slide shaft,

an annular roller shaft having an annular aperture for engaging the slide shaft and having an annular outer surface with a centrally positioned ridge forming a first and second tapered portions on each side of said ridge; and

a first and second annular sub-rollers, each having an annular aperture for engaging the roller shaft, and a substantially spherical outer surface forming a running face against the inner or outer ball grooves; and

a cage disposed between the inner and outer surfaces of the outer and inner joint members and having windows for receiving the ball assemblies and cage webs defined between said windows, said cage web includes a first and second web grooves disposed at the circumferential faces of said cage web extending radially from the inner surface of the cage to the outer surface of the cage.

~~a roller shaft (24) forming a hollow shaft member as a common shaft for a plurality of sub-rollers (22, 23) that spin around said roller shaft (24) and comprising a larger diameter center cylindrical portion (24c), two tapered portions (24b) and two smaller diameter cylindrical portions (24a) for the half spherical rollers (22,23), and an axis hole (24d) for the sliding pin (25)~~
~~a lug shaft (35); and~~

~~an optional center roller (21) forming a ring shaped sub-roller member and providing a rolling contact against the cage flats (4e, 4f) of the constant velocity joint cage (4); and~~

~~a pair of half spherical rollers (22, 23) disposed at and spin around said roller shaft (24) providing a rolling contacts against the inner and/or outer grooves (1a, 2a) of the constant velocity joint races; and~~

~~a lug shaft (35) positioned along the axis hole (24d) of said roller shaft (24) allowing said roller shaft (24) to slide along said lug shaft (35) and either ends of said lug shaft (35) mates into the cage web slots (4i) of the modified cage (4) maintaining the spin axis orientation of said multi-roller ball assembly (20) with respect to the mating cage window (4a).~~

Claim 2 (withdrawn): A multi-roller ball assembly (20) according to claim 1, wherein said center roller (21) is disposed at the cylindrical center surface (24c) of said roller shaft (24) allowing said center roller (21) to spin around and slide along said roller shaft (24) within the axial gap between said half spherical rollers (22, 23).

Claim 3 (withdrawn): A multi-roller ball assembly (20) according to claim 1, wherein said center roller (21) is disposed at the roller seat surfaces (22g, 23g) of said half spherical rollers (22, 23) allowing said center roller (21) to spin around and slide along said half spherical rollers (22, 23).

Claim 4 (withdrawn): A multi-roller ball assembly (20) according to claim 1, wherein said center roller (21) is combined with said roller shaft (24) forming a disc shaft (32) that functions both as a common shaft and as a center roller.

Claim 5 (withdrawn): A multi-roller ball assembly (20) according to claim 1, wherein said center roller (21) is removed so that all of the load from the cage 4 is carried by said lug shaft (35).

Claim 6 (withdrawn): A multi-roller ball assembly (20) according to claim 1, wherein said lug shaft (35) is in the shape of a slender rod (25).

Claim 7 (currently amended): ~~A multi-roller ball assembly (20) according to claim 1, wherein said lug shaft (35) is shaped such that its sliding body (35a) has a larger diameter cylindrical body and its two ends taper down forming a smaller diameter lugs (35b, 35c) that mate into the cage web slots (4i).~~ The constant velocity joint according to claim 1, wherein said first and second lugs of the slide shaft engage the web grooves of the cage, making a slidable contact along said web groove, and thereby allowing a limited radial movement of the ball assembly relative to the cage window.

Claim 8 (currently amended): ~~A multi-roller ball assembly (20)~~ A constant velocity joint according to claim 1, wherein said roller shaft ~~(24)~~ is made of a ~~solid metal, an oil-impregnated sintered metal, or any other~~ sliding bearing material ~~facilitating~~ to facilitate a smooth rotation of said sub-rollers ~~(21, 22, 23)~~.

Claim 9 (currently amended): ~~A multi-roller ball assembly (20)~~ A constant velocity joint according to claim 1, wherein ~~the two sets of sliding or~~ said first and second sub-rollers are supported by a first and second needle bearings ~~(27, 28) are optionally disposed at the interfaces between said~~ on respective roller shaft ~~(24) and said half spherical rollers (22, 23)~~.

Claim 10 (withdrawn): A multi-roller ball assembly (20) according to claim 1, wherein a radial sliding or needle bearing (26) is optionally disposed at the shaft hole of said center roller (21).

Claim 11 (currently amended): ~~A multi-roller ball assembly (20)~~ A constant velocity joint according to claim 1, wherein a first and second ~~pair of~~ retaining rings ~~(29, 30)~~ are ~~optionally~~ disposed at ~~the either ends~~ each of said roller shaft ~~(24)~~ ~~keeping said half spherical rollers (22,~~

~~23)~~ abutting the first and second sub-rollers and keeping the sub-rollers from sliding out of said roller shaft ~~(24)~~ during an assembly process of the constant velocity joints.

Claim 12 (withdrawn): A multi-roller ball assembly (20) according to claim 1, said roller shaft (24) has a snap-on feature at the either ends of said roller shaft (24) keeping said half spherical rollers (22, 23) from sliding out of said roller shaft (24) during an assembly process of the constant velocity joints.

Claim 13 (new): A constant velocity joint according to claim 1, wherein each of said roller shafts is rotatably disposed between the respective slide shaft and the pair of sub-rollers so that said roller shaft can slide along and rotate about said slide shaft thereby allowing a limited circumferential movement of said sub-roller pair relative to the cage window.

Claim 14 (new): A constant velocity joint according to claim 1, said first and second sub-rollers are rotatably supported on the first and second tapered portions of said roller shaft so that said first and second sub-rollers are independently rotatable relative to their respective roller shaft, thereby providing said inner or outer grooves with the independent rolling contacts against the running faces of the first and second sub-rollers.

Claim 15 (new): A constant velocity joint according to claim 14, said running face of the first sub-roller and said running face of the second sub-roller form a single spherical surface.